



Spectral Gamma-Ray Borehole  
Log Data Report

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Borehole

20-02-09

Log Event A

### Borehole Information

|                         |                                 |                                  |
|-------------------------|---------------------------------|----------------------------------|
| Farm : <u>B</u>         | Tank : <u>B-102</u>             | Site Number : <u>299-E33-182</u> |
| N-Coord : <u>45,337</u> | W-Coord : <u>52,598</u>         | TOC Elevation : <u>652.81</u>    |
| Water Level, ft :       | Date Drilled : <u>2/28/1972</u> |                                  |

### Casing Record

|                            |                                |                    |
|----------------------------|--------------------------------|--------------------|
| Type : <u>Steel-welded</u> | Thickness : <u>0.280</u>       | ID, in. : <u>6</u> |
| Top Depth, ft. : <u>0</u>  | Bottom Depth, ft. : <u>100</u> |                    |

### Borehole Notes:

Borehole 20-02-09 was drilled in February 1972. The borehole was completed at a depth of 100 ft with 6-in. casing.

The casing thickness is presumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. steel pipe.

### Equipment Information

|                                   |   |  |
|-----------------------------------|---|--|
| Logging System : <u>2</u>         | Detector Type : <u>HPGe</u>               | Detector Efficiency: <u>35.0 %</u>     |
| Calibration Date : <u>05/1997</u> | Calibration Reference : <u>GJO-HAN-14</u> | Logging Procedure : <u>P-GJPO-1783</u> |

### Logging Information

|                                 |                                  |                                       |
|---------------------------------|----------------------------------|---------------------------------------|
| Log Run Number : <u>1</u>       | Log Run Date : <u>09/11/1997</u> | Logging Engineer: <u>Alan Pearson</u> |
| Start Depth, ft.: <u>99.0</u>   | Counting Time, sec.: <u>100</u>  | L/R : <u>L</u> Shield : <u>N</u>      |
| Finish Depth, ft. : <u>27.0</u> | MSA Interval, ft. : <u>0.5</u>   | Log Speed, ft/min.: <u>n/a</u>        |

|                                |                                  |                                       |
|--------------------------------|----------------------------------|---------------------------------------|
| Log Run Number : <u>2</u>      | Log Run Date : <u>09/16/1997</u> | Logging Engineer: <u>Alan Pearson</u> |
| Start Depth, ft.: <u>28.0</u>  | Counting Time, sec.: <u>100</u>  | L/R : <u>L</u> Shield : <u>N</u>      |
| Finish Depth, ft. : <u>0.0</u> | MSA Interval, ft. : <u>0.5</u>   | Log Speed, ft/min.: <u>n/a</u>        |

|                                |                                  |                                       |
|--------------------------------|----------------------------------|---------------------------------------|
| Log Run Number : <u>3</u>      | Log Run Date : <u>09/16/1997</u> | Logging Engineer: <u>Alan Pearson</u> |
| Start Depth, ft.: <u>15.0</u>  | Counting Time, sec.: <u>100</u>  | L/R : <u>L</u> Shield : <u>N</u>      |
| Finish Depth, ft. : <u>0.0</u> | MSA Interval, ft. : <u>0.5</u>   | Log Speed, ft/min.: <u>n/a</u>        |



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### Logging Operation Notes:

This borehole was logged by the SGLS in three log runs. Two log runs were required to log the borehole. The third log run repeated a segment of the borehole log as an additional quality assurance measure.

The top of the casing, which is the zero reference for the SGLS, is approximately even with the ground surface. The present measured depth of the borehole is 99.4 ft. The total logging depth achieved was 99.0 ft.

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## Analysis Information

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Analyst : H.D. Mac Lean

Data Processing Reference : MAC-VZCP-1.7.9

Analysis Date : 04/24/1998

### Analysis Notes :

The pre- and post-survey field verification spectra for all logging runs met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from these spectra were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during the logging operation.

A casing correction factor for a 0.280-in.-thick steel casing was applied to the concentration data during the analysis process.

Shape factor analysis was applied to the SGLS data. Shape factor parameters can provide insights into the distribution of Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity. However, results were inconclusive for these borehole data and were not included in the final report.

### Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A plot of the repeated log interval is included and shows the concentrations of the Cs-137 and the naturally occurring radionuclides, calculated using data sets provided by the original and repeated log runs.

### Results/Interpretations:

The man-made radionuclides Cs-137 and Co-60 were detected in this borehole. The Cs-137 contamination was measured nearly continuously from the ground surface to a depth of 14.5 ft and from 19.5 to 23 ft. Isolated occurrences of Cs-137 were detected between 25 and 36 ft and at the bottom of the logged interval (99 ft). Measured concentrations from just below the ground surface to about 8 ft ranged from 0.2 to 3 pCi/g.



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Below a depth of 8 ft, the measured concentrations decreased to less than 1 pCi/g and were just above the MDL at about 0.2 pCi/g in many instances. Co-60 contamination was detected between 72 and 97 ft. Concentrations were all below 0.5 pCi/g.

The K-40 concentration values increase from a background of about 12 pCi/g above 38 ft to a background of 15 to 16 pCi/g below a depth of 40 ft. There is a perceptible increase in the K-40 concentrations to a background of 18 pCi/g at a depth of 82 ft. The U-238 concentrations increase markedly below a depth of 28.5 ft because of fluctuations in radon in the borehole between consecutive logging runs.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Reports for tanks B-102 and B-105.